DOCKETED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Percival	Atty Docket:	1348/104
Serial No.:	08/657,777	Art Unit:	2312
Date Filed:	May 31, 1996	Examiner:	Bragdon, R.
For:	CACHE FOR USE ON A NETWORK		

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231 on April 1, 1998.

Barbara N. Shapiro

Barbara N. Shapiro

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Assistant Commissioner for Patents
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT

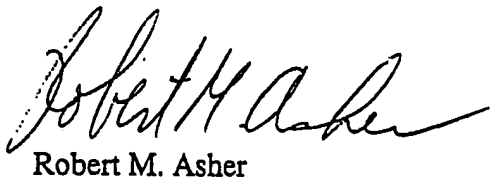
Dear Sir:

On September 4, 1997, representatives of Digital Equipment Corporation met with EEC to discuss U.S. Patent No. 5,577,226, the parent of the present application. Digital asserted that several items of prior art were applicable to the claims. This included several publications that are listed on Form 1449 and enclosed herewith, as well as VI0C, a Digital product, which they assert was released for sale in June 1993. VI0C is described in the materials enclosed herewith entitled "Meeting between Digital and EEC." Those materials also point to specific portions of

the publications. The Examiner is encouraged to fully consider the applicability of VI0C and the publications to the claims of the present application.

Dated: 4/1/98

Respectfully submitted,



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SECTION 2: FORM PTO 1449 - MODIFIED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Ian Percival	Atty Dkt:	1348/104
Serial No:	08/657,777	Art Unit:	2312
Date Filed:	May 31, 1996	Examiner:	R. Bragdon
Invention:	CACHE FOR USE ON A NETWORK		

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Assistant Commissioner for Patents
Washington, DC 20231

LIST OF PUBLICATIONS FOR APPLICANT'S
INFORMATION DISCLOSURE STATEMENT

Exam. Init.	Ref. No.	Document
	BM	"The VAX/VMS Distributed Lock Manager", Snaman, Jr., William E et al., *Digital Technical Journal*, No. 5, Sept. 1987
	BN	"The Design and Implementation of a Distributed File System", Goldstein, *Digital Technical Journal*, No. 5, Sept. 1987
	BO	"File System Operation in a VAXcluster Environment", Chapter 8, *VMS File System Internals*, McCoy, *Digital Press*, 1990

Examiner: _____

Date Considered: _____

NOTE FOR EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance AND not considered. Include copy of this form with next communication to applicant.

Meeting between Digital and EEC
September 4, 1997

35 U.S.C. § 102
A person shall be entitled to a patent unless –
(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or ...

U.S. Patent No. 5,577,226: filed May 6, 1994, issued November 19, 1996

"VAX/VMS Distributed Lock Manager", Snaman et al., *Digital Tech. J.*, no. 5, September 1987, pp 29-44

"The Design and Implementation of a Distributed File System", Andrew C. Goldstein, *Digital Tech. J.*, no. 5, September 1987, pp 45-55

VMS File System Internals, Kirby McCoy, Digital Press, 1990, pp 339-344, 352-354, 374-388

VIOC limited distribution kit shipping date: March 1992 (still checking)
VIOC initial field test date: June 1992
VIOC product release date: June 1993 (shipped to all VAX/VMS customers)

PRIOR ART: VIOC
VMS Environment
Example of VIOC operation and Figs. 1A-1E
Claim chart for claim 20 of U.S. Patent No. 5,577,226 vs. example of VIOC operation
Claim chart for claim 27 of U.S. Patent No. 5,577,226 vs. example of VIOC operation

PRIOR ART: VMS FILE SYSTEM INTERNALS, XQP ARBITRATION LOCK
Arbitration Lock Kirby pp 343-344, 352-354, 374-382; Goldstein p 53
file metadata is treated as data under some circumstances, Kirby pp 386-388

PRIOR ART: VMS FILE SYSTEM INTERNALS, XQP CACHE FLUSH LOCK
Cache Flush Lock, used for quota cache Kirby 344-346, 383-386; Goldstein pp 53-54

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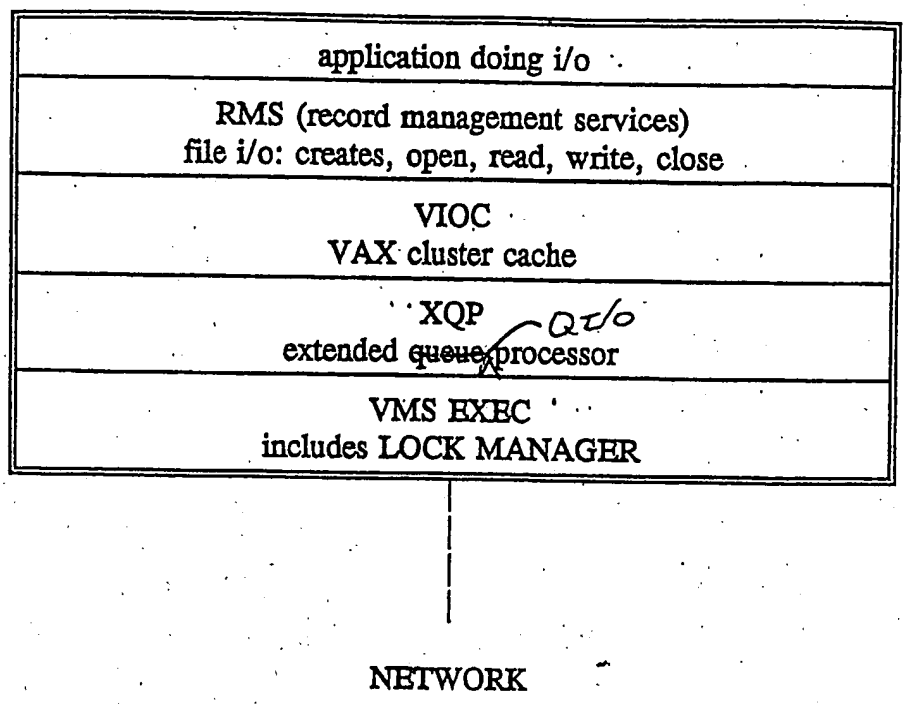
VMS ENVIRONMENT



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EXAMPLE OF VIOC OPERATION

1. Assume that LOCK MANAGER on NODE A is master of a resource (file), and that invocations of VIOC in NODE B and NODE C have locks on the resource (file) at level PR/bAST. See FIG. 1A.

   bAST = blocking asynchronous system trap
   A lock with a bAST allows use of a resource, and when another party wants to use the resource in a manner conflicting with the existing lock, the lock holder is notified. By convention, the lock holder then attempts to get to a state where it can release its lock, permitting use by the other party.

2. An application on NODE A now wants to write to the file. The invocation of VIOC issues a lock request to the LOCK MANAGER on NODE A:

   (file, CW)

3. The LOCK MANAGER in NODE A, because it is the master, determines that the CW lock cannot be granted due to the existing PR locks and enqueues the CW lock request. However, since the PR locks each have an associated bAST, the LOCK MANAGER on NODE A notifies each of the lock holders that another party wishes to use the resource (file). See FIG. 1B.

4. At each of NODES B, C, the LOCK MANAGER receives the bAST notice from the LOCK MANAGER on NODE A, and calls a bAST routine which communicates with the respective invocation of VIOC. Each VIOC marks its cache entry as invalid, issues a request to its LOCK MANAGER to lower its lock level to CR:

   (file, CR)

   and then issues an enqueue request to its LOCK MANAGER for an upgraded lock:

   (file, PR/bAST/cAST)

   See FIG. 1C

   cAST = completion asynchronous system trap
   A lock with a cAST is enqueued and waits until an in-progress event is completed. The lock holder is notified upon completion of the in-progress event.

5. The master LOCK MANAGER on NODE A now determines that it can grant the enqueued request for a CW lock, and does so. The VIOC on NODE A reads the file into its cache, sets its lock to CW and its status to VALID. The application on NODE A now writes to the file. See FIG. 1D.

6. Eventually, the application on NODE A closes the file, and VIOC tells its LOCK MANAGER to release the lock

(file, ∅)

VIOC also marks the cached file as INVALID

7. The master LOCK MANAGER on NODE A now determines that it can grant the enqueued requests for PR/bAST/cAST locks and does so, accordingly notifying the lock holders of the completion of the prior in-progress event. See FIG. 1E. The master LOCK MANAGER also deletes the CR locks in favor of the just-granted PR locks.

8. At each of NODES B, C, the LOCK MANAGER receives the cAST notice from the LOCK MANAGER on NODE A, and calls a cAST routine which communicates with the respective invocation of VIOC, which in turn notifies its application program that a PR/bAST lock has been re-obtained.

for 9/4/97 meeti

① creating the claimed
② creating the claimed data structure

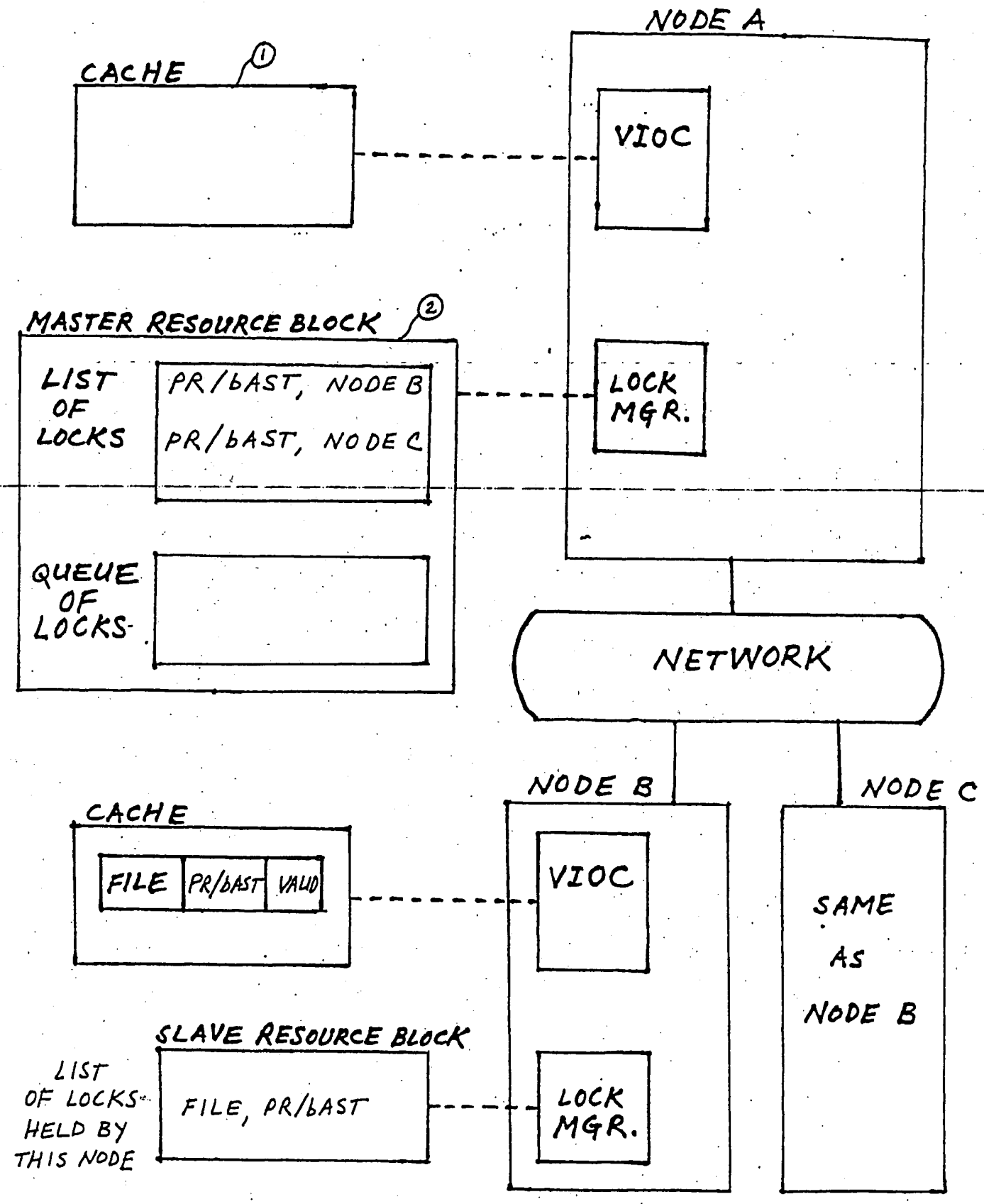

FIG. 1A

EXAMPLE OF VIOC OPERATION

for 9/4/97 meeti

③ communicating over the network to invalidate cached data

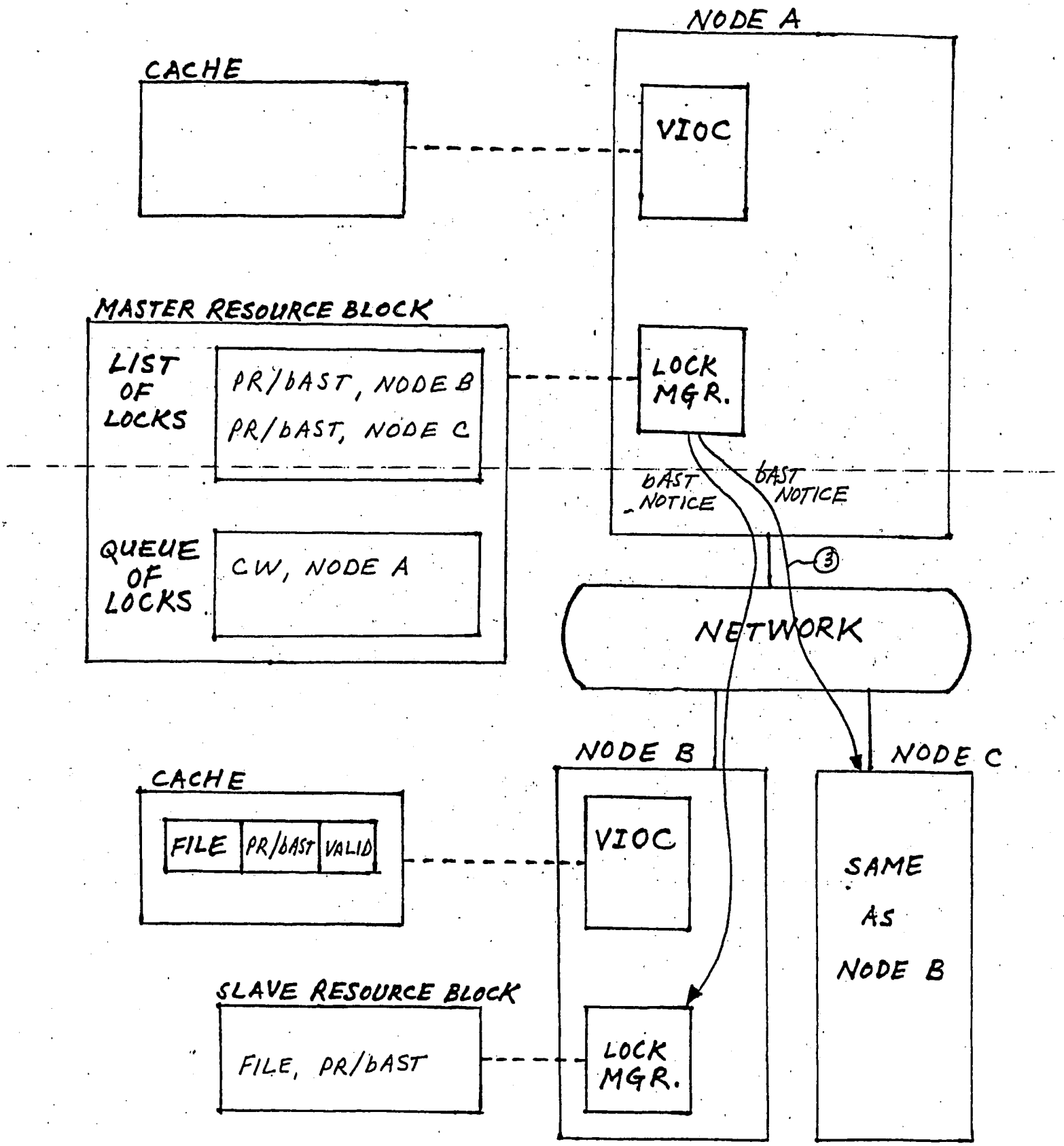

FIG. 1B

for 9/4/97 meeting

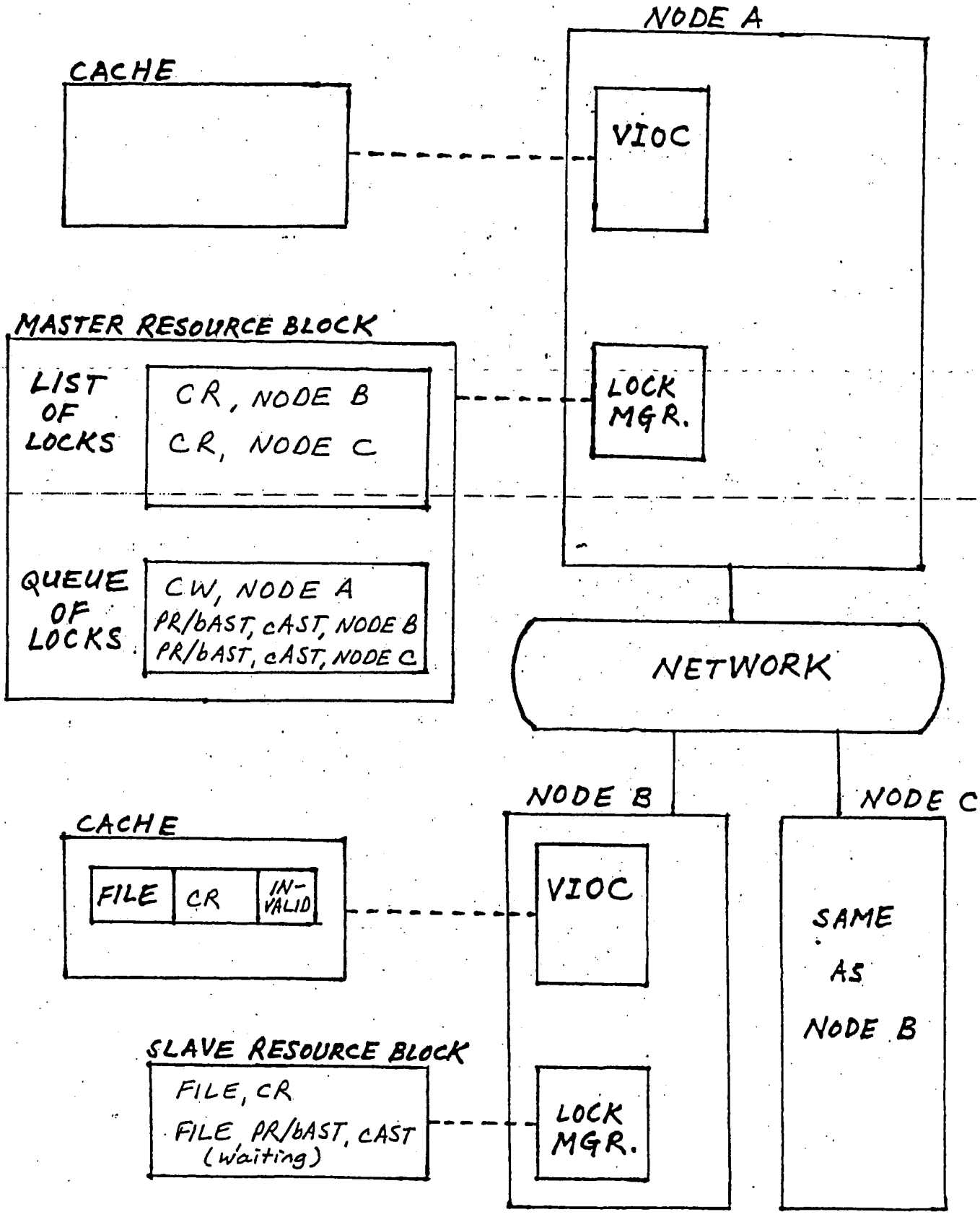

FIG. 1C

for 9/4/97 meeting ④ intercepting the cached write instruction

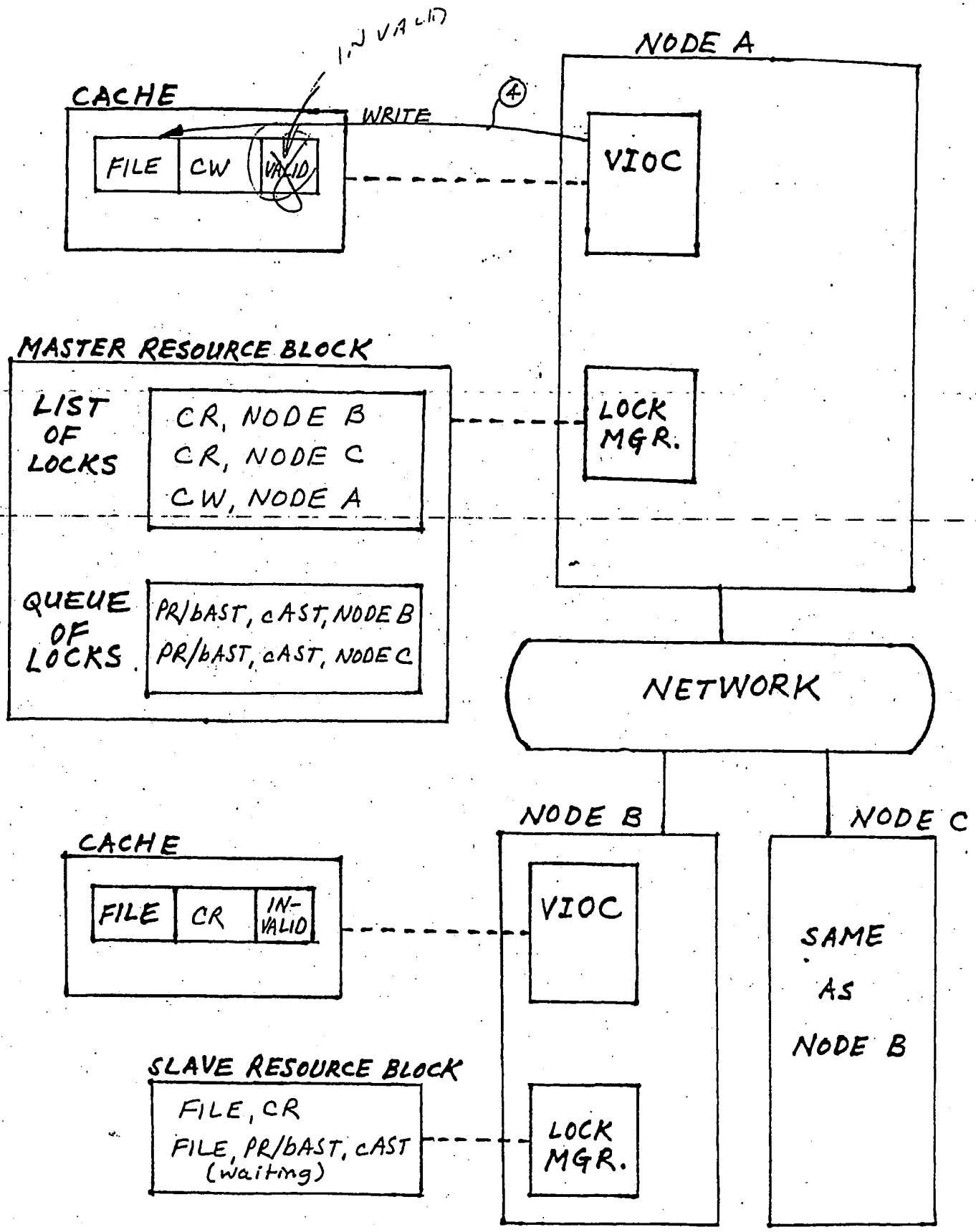

FIG. 1D

for 9/4/97 meeti

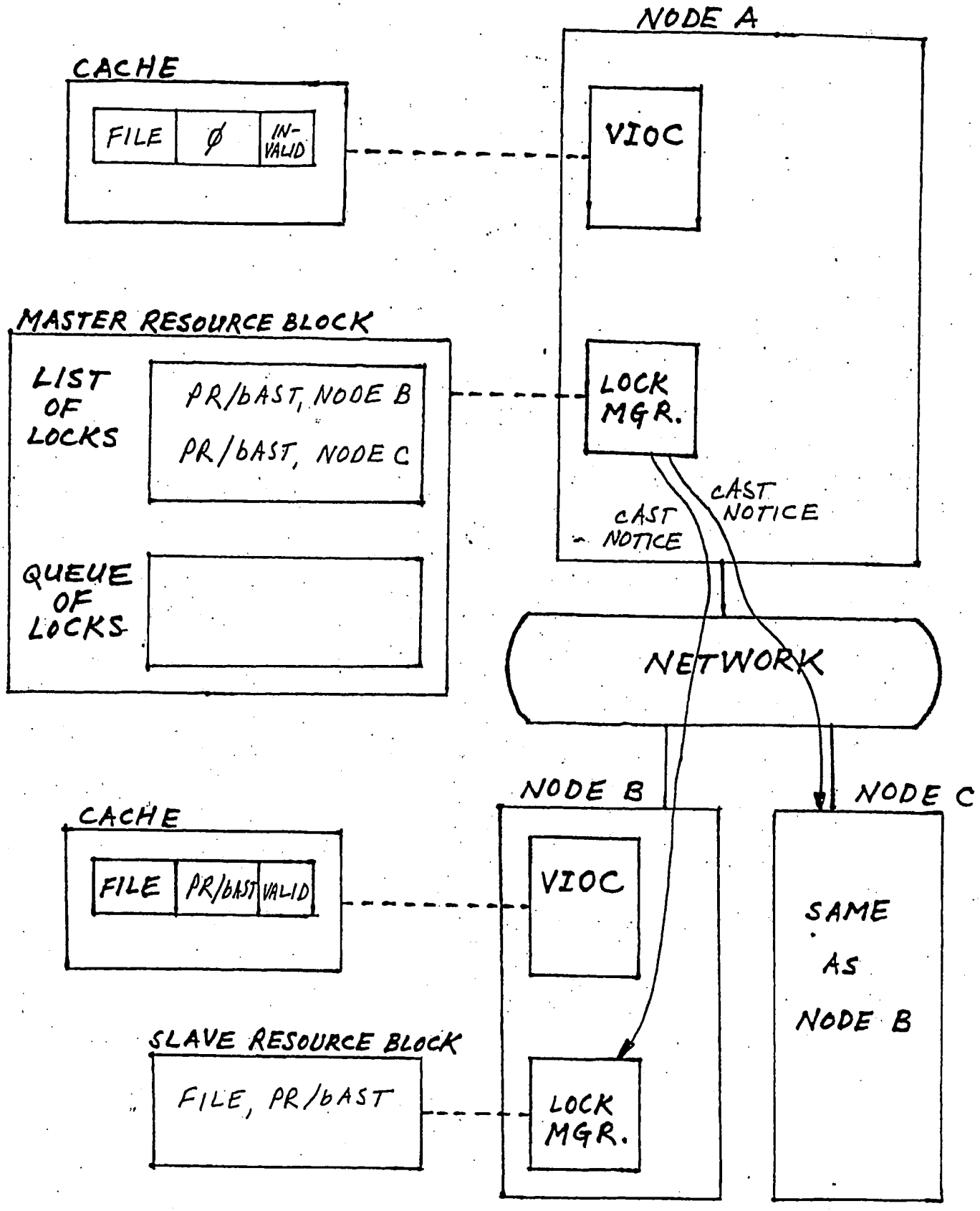

FIG. 1E

U.S. Patent N . 5,577,226 (Percival)	VIOC & Lock Manager
20. A cache driver perating in a computer having a RAM and connected to a network f remote computers, said cache driver comprising:	VIOC is a cache driver operating in a VAX computer which has a RAM and is connected to a network (cluster) of remote VAX computers.
means for creating a cache having a plurality of data structures for identifying a plurality of data buckets located in the RAM of said computer;	The VAX computer programmed with the VIOC program creates a cache having plural data structures for identifying plural data buckets (relative and indexed file organizations) located in the RAM of the VAX.
remote message means for communicating with cache drivers on any of said remote computers;	The VAX computer programmed with the VMS EXEC program is remote message means which communicates with cache drivers (remote VIOC) on the other VAXes in the cluster.
means for creating a data structure for each of a plurality of I/O devices connected to said network for which data may be cached by said computer, each said data structure including a list of all computers on said network that permit caching with respect to the I/O device corresponding to said data structure;	The VAX computer programmed with the master LOCK MANAGER creates a master resource block (data structure) in the computer for each of the plurality of files (which can correspond to separate I/O devices) which may be cached by the computer. The master resource block includes a list of locks for all users (which may be computers) on the network that permit caching with respect to the file (I/O device) corresponding to the master resource block (data structure).
write intercept means for intercepting a write instruction to one of said plurality of I/O devices from said computer; and	The VAX computer programmed with the VIOC program intercepts a write instruction to the file from its application program.
means for using said remote message means to communicate individually with each computer in the list of computers in the data structure corresponding to said one of said I/O devices to invalidate data in the RAM of said remote computers corresponding to said one of said plurality of I/O devices.	When there are existing locks with a bAST, the VAX computer programmed with the master LOCK MANAGER notifies each of the lock holders (which may be computers in the master resource block), to hopefully cause the lock holders to release their locks. When a lock holder releases its lock, it invalidates its cached file.

U.S. Patent No. 5,577,226 (Percival)	VIOC & Lock Manager
27. A method for accelerating access to data on a network comprising the steps of:	VIOC has its own cache to accelerate access to a file (data) on a network
creating a cache in the RAM of a computer connected to the network;	VIOC creates a cache in the RAM of a computer on which it is running. The computer, as part of a VAX cluster, is connected to the network.
creating a data structure in the computer for each of a plurality of I/O devices connected to said network for which data may be cached by said computer, each said data structure including a list of all computers on said network that permit caching with respect to the I/O device corresponding to said data structure;	The master LOCK MANAGER creates a master resource block (data structure) in the computer for each of the plurality of files (which can correspond to separate I/O devices) which may be cached by the computer. The master resource block includes a list of locks for all users (which may be computers) on the network that permit caching with respect to the file (I/O device) corresponding to the master resource block (data structure).
intercepting a write instruction to one of said plurality of I/O devices from said computer; and	VIOC intercepts a write instruction to the file from its application program.
communicating over the network individually with each computer in the list of computers in the data structure corresponding to said one of said I/O devices to invalidate data in caches on the network corresponding to said one of said plurality of I/O devices.	When there are existing locks with a bAST, LOCK MANAGER notifies each of the lock holders (which may be computers in the master resource block), to hopefully cause the lock holders to release their locks. When a lock holder releases its lock, it invalidates its cached file.